

0.05. In Canada, St. Johns, N. F., 0.18; Chatham, 0.06; Quebec and Kingston, 0.03.

As compared with the preceding month of May, the pressures reduced to sea level show falls throughout the country. The regions of greatest falls were Kansas and Nebraska and Cape Breton and Newfoundland. The greatest falls were: In the United States, Concordia, 0.18; Dodge City and Wichita, 0.17; Omaha, 0.16; Yankton, 0.15. In Canada, St. Johns, 0.22; Sydney, 0.13; Calgary and Halifax, 0.12; Chatham, 0.11; Minnedosa, 0.10.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During the month of June seven high areas and nine low areas were sufficiently well defined to be charted. (See Charts I and II.) The accompanying table gives the principal facts as to the region of origin and disappearance of these areas, the length of path, and apparent velocity, and a few general remarks are added.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.										
I.....	1, a. m.	45	90	3, a. m.	33	75	Miles. 1,200	Days. 2.0	Miles. 600	Miles. 30.0
II.....	2, p. m.	47	125	3, p. m.	44	68	4,490	6.0	748	31.2
III.....	4, p. m.	48	124	7, a. m.	33	99	1,880	2.5	751	31.3
IV.....	5, p. m.	52	105	11, p. m.	34	77	2,800	6.0	533	22.2
V.....	6, p. m.	41	126	11, p. m.	41	100	2,200	5.0	439	18.3
VI.....	15, a. m.	39	123	23, a. m.	37	71	2,670	8.0	459	19.1
VII.....	23, a. m.	54	115	30, a. m.	38	81	3,150	7.0	450	18.8
Total.....							19,790	36.5	3,980	
Mean of 7 paths.....							2,827	5.2	568	23.7
Mean of 36.5 days.....									542	22.6
Low areas.										
I.....	1, a. m.	38	106	4, p. m.	47	81	1,500	3.5	429	17.9
II.....	4, p. m.	48	103	6, p. m.	43	83	1,310	2.0	657	27.4
III.....	6, a. m.	34	94	8, a. m.	31	80	1,160	2.0	589	24.3
IV.....	6, p. m.	50	117	10, p. m.	39	100	2,080	4.0	520	21.0
V.....	10, p. m.	53	118	19, p. m.	41	95	4,300	3.5	505	21.0
VI.....	19, p. m.	46	78	21, p. m.	46	65	2,680	2.0	815	18.1
VII.....	20, a. m.	41	125	23, a. m.	50	89	2,080	2.0	1,047	43.7
VIII.....	23, a. m.	52	111	30, a. m.	47	59	2,900	4.0	725	30.3
IX.....	23, a. m.	51	122	"	50	94	1,500	3.0	500	20.8
Total.....							17,410	31.0	5,266	
Mean of 9 paths.....							1,934	3.4	585	24.4
Mean of 31 days.....									568	23.4

* July 1, a. m.

HIGHS.

No. I was the continuation of VII of the May REVIEW. Its velocity of 16 miles per hour in May was accelerated to 25 miles in June, as it advanced southeast to the south Atlantic Coast, where it was last noted a. m. of the 3d. As noted in the May REVIEW, there was this month also a general motion of highs II, III, V, and VI first along the Pacific Coast northward, and then east or southeast toward the Atlantic Coast, where II and VI disappeared p. m. of the 8th and a. m. of the 23d, respectively; V was last noted in Nebraska p. m. of the 11th, and III in Texas a. m. of the 7th. It is probable that this northward shift of these highs was due to the apparent motion of the Pacific permanent high.

The general track of the highs was along rather high latitudes. Nos. I, IV, VI, and VII united with the permanent Atlantic high pressure area.

The heaviest rains of the month were on the 4th in the Gulf States between high II and the permanent Atlantic high. Apparently the presence of a well-defined low was not needed for these rains.

LOWS.

Most of the storms of the month began to the north of

Montana, and their general track was eastward to the north of our stations of observation. Only one, No. VII, began off the Pacific Coast.

Two of these storms, VI and VIII, reached the Gulf of St. Lawrence; all the rest were dissipated or filled up in the interior of the country.

The heaviest rainfall in northern latitudes occurred on the 17th in the Lake Region. In this case low area No. V was central in Assiniboia, the pressure at Medicine Hat, 29.18, was the lowest of the month. Since the distance from this low to the region of rainfall was over 1,200 miles it is highly probable that the rain was due to secondary conditions which, however, do not appear by bendings of isobars or wind directions.

The thunderstorms of the month reached a culmination on the 14th and 15th in the evening and on the 23d in the morning.

LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

2d.—David, Indian Ter. (1 mile southwest of Chelsea), 6 p. m. central time; 1 killed, 8 injured; property loss, \$3,000; path from 200 yards to $\frac{1}{2}$ mile wide, length uncertain, said to be 30 miles; moved to the east. Heavy rains and winds throughout portions of eastern Texas on the 2d and 3d injured growing crops and wrecked possibly as many as 30 buildings, the greatest destruction at a single place occurring at Grand Prairie, within 13 miles of Dallas. Newspaper reports place the damage to crops at a quarter of a million dollars.

3d.—On this date severe local storms were reported from Texas, Mississippi, Alabama, and New York. The storm in New York State seems to have been a true tornado. It was first observed near Westmoreland, Oneida County, at 5 p. m. eastern time. One person was killed and 3 injured. The funnel cloud is described as having an irregular swaying motion, rising and falling alternately. It moved toward the east in a path about $\frac{1}{2}$ a mile wide and 5 miles long. A conservative estimate places the amount of damage at \$18,000.

7th.—Destructive hailstorms were reported in Pratt, Reno, Sedgwick, and Sumner counties, Kans.

10th.—A widespread and rather destructive storm of wind and rain overspread eastern Colorado and the western border of Kansas on the evening of the 10th. A number of wash-outs on the railroads interfered with travel, and the damage to culverts and bridges was considerable.

Several minor tornadoes were observed in southern Minnesota on the evening of the 10th. In most cases the funnel cloud at the point of contact with the earth was quite small; the whirl covered a small area and the destruction of life and property was not great. The most severe whirl originated in Lyle Township, Mower County, near the State line, and moved eastward rather slowly, being clearly visible when a mile away. But 1 person was killed although 22 were more or less injured. The property loss was probably \$10,000. Path of the storm 80 rods wide, 6 miles long; moved east.

The second storm of importance was first observed north of Mapleton, Blue Earth County, about 4 p. m., central time. It moved a little north of east into Waseca County, passing near Little Cobb and Alma City, where it was last observed. Two persons were injured and the property loss probably reached \$6,000. The path of the storm was quite narrow, probably 100 feet on the average, and the distance traveled was about 12 miles. The third storm formed about 2 p. m. in Kandiyohi County, near the railroad station of the same name. No casualties; path, 20 feet wide; 3 miles long; property loss about \$1,000; moved northeast.

The tornado cloud was closely observed by Mr. Charles U. Peterson, who remarks upon it as follows:

This storm passed about 3 miles south of town but I was within 80 rods from it, and saw how it worked. The main cloud was quite a ways up, while the funnel came down to the ground. It appeared to be about the same size from top to bottom, about 12 feet in diameter and perfectly white. The roar sounded as when a heavy train comes thundering along, *although not a breath of wind was to be felt where I was.*

Other funnel clouds were doubtless observed of which no record has been made.

13th. A few isolated but destructive wind and hail storms were reported as occurring in central and eastern Ohio. Newspaper estimates of the damage at Columbus, Ohio, place the amount at \$10,000.

14th.—Damaging hailstorms occurred in central Connecticut.

16th.—Severe local storms visited central Ohio.

17th and 18th.—Severe local storms occurred on the 17th in Oklahoma, Kansas, Nebraska, and Missouri, passing eastward into adjoining States on the early morning of the 18th without any noticeable decrease in intensity. The blow at Louisville, Ky., was reported by the local press as being the most severe since the memorable tornado of March 27, 1890. Four boys were killed and 5 injured on the farm of the State Asylum for the feeble-minded near Lincoln, Ill. The barn in which the boys had taken shelter was blown down by the gale.

19th.—Severe local storms were experienced in the mountain regions of Pennsylvania.

20th.—A severe local storm in the vicinity of Duncan, Platte County, Neb., caused the destruction of 3 buildings and other smaller structures.

24th.—The hailstorms that occurred in Topeka and Pueblo, Kans., on this date were of extraordinary violence. The size of the stones was carefully determined at both places. Observer Jennings, of Topeka, Kans., describes them in the following words:

While the big hail was falling the observer placed a bucket over his head, and with another bucket ran out and scooped up a dozen balls. With a knife frequently steeped in hot water, these were cut in two and measured, giving the following diameters: One 4.75 inches, one 6.0, one 5.25, one 4.0, one 3.0 one 3.5, one 5.0, one 4.0, one 3.0, one 3.5, one 3.5, one 3.0, one 3.0, giving a mean for the whole lot of 4 inches.

In Topeka 26 people were more or less severely injured by the hail. Much damage was done to roofs, skylights were broken to pieces, and the upper floors damaged by rain. The storm was local, not extending, so far as known, beyond the limits of Shawnee County.

The hailstones that fell in Pueblo were not quite so large as those that fell in Topeka, the largest measuring from 2 to 2.75 inches in diameter and weighing from 4 to 8 ounces. The damage to windows and roofs was not great, since the large hail was confined to a portion of the southern part of the city only. Hail began at Topeka at 7:35 p. m.; at Pueblo, 8:15 p. m., eastern time.

On the same date a tornado was observed north of Culver, Ottawa County, Kans. It moved a little north of east for a distance of 5 or 6 miles, passing and partly demolishing about twenty farm houses. The house of George W. Geesey was totally destroyed, 3 of the inmates killed and 4 severely injured. Property loss about \$3,000.

26th.—Heavy rains and high winds in eastern Kansas and Missouri, also in South Carolina.

27th.—High winds in central Arkansas, accompanied by heavy rain.

of the Weather Bureau, which also gives the height of the thermometers above the ground at each station. The mean temperature is given for each station in Table II, for voluntary observers.

The *monthly mean temperatures* published in Table I, for the regular stations of the Weather Bureau, are the simple means of all the daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to Table II. The mean temperatures given in Table III for Canadian stations are the simple means of 8 a. m. and 8 p. m. simultaneous observations.

The *regular diurnal period* in temperature is shown by the hourly means given in Table V for 29 stations selected out of 82 that maintain continuous thermograph records.

The *distribution of the observed monthly mean temperature* of the air over the United States and Canada is shown by the dotted isotherms on Chart IV; the lines are drawn over the Rocky Mountain Plateau region, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

The *highest mean temperatures* were: In the United States, Jacksonville, 83.4; Yuma, 83.0; Phoenix, Port Eads, and Montgomery, 82.6; Key West, 82.2. In Canada, Swift Current and Ottawa, 60.7; Kamloops, 64.4; Winnipeg and Toronto, 60.8; Port Stanley, 60.6; Montreal, 60.3. The *lowest* were: In the United States, Tatoosh Island, 53.7; Sault Ste. Marie, 53.8; Eastport, 54.0; Port Angeles, 54.1; Duluth, 54.2; Marquette, 54.6. In Canada, St. Johns, N. F., 47.2; Grindstone, 49.9; Farther Point, 51.2; Yarmouth, 53.0; Sydney, 53.2; Port Arthur, 54.8; White River, 55.0.

As compared with the normal for June, the mean temperature for the current month was in excess in the South Atlantic and Gulf States and on the north Pacific Coast. It was deficient in the Lake Region, New England, and Maritime Provinces.

The greatest excesses were: In the United States, Jacksonville and Wichita, 3.4; Montgomery, 3.1; Savannah, 3.0; Atlanta, 2.9; Port Eads, 2.7; Augusta, 2.6; Topeka, 2.5; Astoria and Keokuk, 2.1. In Canada (by the means of 8 a. m. and 8 p. m. observations), Swift Current, 2.7; Edmonton, 1.6. The deficits were: In the United States, Sault Ste. Marie, 6.0; Minneapolis and Portland, Me., 4.1; Northfield, 3.7; Duluth and Boston, 3.6; Harrisburg, 3.3. In Canada (for 8 a. m. and 8 p. m., eastern time), St. Johns, N. F., and Montreal, 4.2; Quebec, 3.9; White River, 3.7; Chatham, 2.9.

Considered by districts the mean temperatures of the current month show departures from the normal as given in Table I. The greatest positive departures were: South Atlantic, 1.6; east Gulf, 2.1. The greatest negative departures were: New England, 2.5; lower Lake, 2.4; upper Lake, 2.1.

The *years of highest and lowest mean temperatures* for June are shown in Table I of the Review for June, 1894. The mean temperature for the current month was the highest on record at: Jacksonville, 83.4; Montgomery, 82.6; Jupiter, 81.0. It was the lowest on record at: Sault Ste. Marie, 53.8; Marquette, 54.6; Northfield, 57.4; Portland, Me., 58.2; Woods Hole, 60.2; Narragansett Pier, 61.8; Vineyard Haven, 63.0; Albany, 64.6; Harrisburg, 67.2.

The *maximum and minimum temperatures* of the current month are given in Table I. The highest maxima were: 107, Phoenix (21st); 106, Yuma (frequently); 105, Fresno (30th); 104, Red Bluff (6th). The lowest maxima were: 66, Tatoosh Island (19th); 69, Eureka (11th); 70, Port Angeles (20th) and Eastport (26th); 73, Woods Hole (16th). The highest minima were: 72, Port Eads (5th); 71, Jupiter (frequently);

TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

The mean temperatures and the departures from the normal, as determined from records of the maximum and minimum thermometers, are given in Table I for the regular stations